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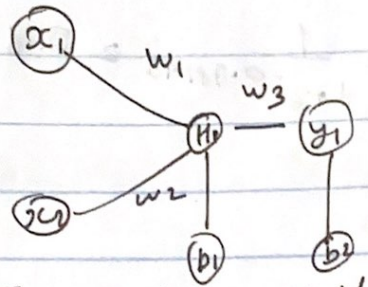

To calculate Hidden layers:

$$H_1 = x_1 w_1 + x_2 w_2 + b_1$$

& activation function is sigmoid

$$= \frac{a}{1+e^{-x}}$$

$\therefore x_1 = 0.05$
$x_2 = 0.10$ Target - $T_1 = 0.99$
$b_1 = 0.40$
$b_2 = 0.60$
Initial weights $= w_1 = 0.10, w_2 = 0.20, w_3 = 30$

* Forward Step

$$H_1 = x_1 w_1 + x_2 w_2 + b_1$$
$$= 0.05 \times 0.10 + 0.50 \times 0.20 + 0.40$$
$$= 0.425$$

Out $H_1 = \frac{1}{1+e^{-H_1}} = \frac{1}{1+e^{-0.425}} = 0.60467$

$y_1 = \text{out}H_1 * w_3 + b_2 = 0.60467 * 0.30 + 0.60$
$x_1 = 0.78140$

$$\text{out } Y_1 = \frac{1}{1+e^{-Y_1}} = \frac{1}{1+e^{-0.78140}} = 0.6859$$

* Calculating total error

$$E_{Total} = \frac{1}{2}(T - \text{out } Y_1)^2$$

$$= \frac{1}{2}(0.99 - 0.68)^2$$

$$= 0.048$$

* Backward Pass

lets consider Error at $w_3 = \frac{\partial E_{Total}}{\partial w_3}$

$$= -0.51 \times 0.2176 \times 0.804$$

$$= 0.040$$

$$\frac{\partial E_{Total}}{\partial w_3} = \frac{\partial E_{Total}}{\partial \text{out } Y_1} \times \frac{\partial \text{out } Y_1}{\partial Y_1} \times \frac{\partial Y_1}{\partial w_3}$$

$$= 2 \times \frac{1}{2}(T - \text{out } Y_1) \times -1$$

$$= 0.31$$

$$\frac{\partial \text{out } Y_1}{\partial Y_1} = \text{out } Y_1 (1 - \text{out } Y_1) \times 1 = 0.2176$$

$$\frac{\partial Y_1}{\partial w_2} = \text{out } H_1 = 0.60467$$

Updating w_3

$$w_3 = w_3 - \eta \frac{\partial E_{Total}}{\partial w_2} = 0.30 - 0.5(-0.040)$$
$$= 0.32$$

Similarly calculate error at w_2 & w_1 & update

$$\frac{\partial E_{Total}}{\partial w_1} = \frac{\partial E_{total}}{\partial out_1} \times \frac{\partial out_{H_1}}{\partial H_1} \times \frac{\partial H_1}{\partial w_1} = 0.02 \times 0.24 \times 0.05$$
$$= -0.00024$$

$$\frac{\partial E_{total}}{\partial out_{H_1}} = \frac{\partial E_1}{\partial out_{y_1}} \times \frac{\partial out_{y_1}}{\partial y_1} \times \frac{\partial y_1}{\partial out_{H_1}}$$

$$= -0.31 \times 0.2496 \times 0.30$$
$$= -0.02$$

$$\frac{\partial out_{H_1}}{\partial H_1} = out_{H_1}(1 - out_{H_1}) = 0.24$$

$$\frac{\partial H_1}{\partial w_1} = x_1 = 0.05$$

Updating w_1 : $w_1 = w_1 - \eta \frac{\partial E_{total}}{\partial w_1} = 0.10 - 0.5(-0.00)$

$w_1 = 0.10012$

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$$\therefore \frac{\partial E_{total}}{\partial w_2} = \frac{\partial E_{total}}{\partial out_{H_1}} \times \frac{\partial out_{H_1}}{\partial H_1} \times \frac{\partial H_1}{\partial w_2}$$

$$\therefore \frac{\partial E_{total}}{\partial out_{H_1}} = -0.02$$

$$\therefore \frac{\partial out_{H_1}}{\partial H_1} = 0.24$$

$$\frac{\partial H_1}{\partial w_2} = x_2 = 0.10$$

$$= -0.02 \times 0.24 \times 0.10$$

$$= -0.00048$$

Updated weights : $w_1 = 0.10012$, $w_2 = -0.00048$,

$w_3 = -0.03024$